NOTES ON MARINE ALGAE OF WASHINGTON AND SOUTHERN BRITISH COLUMBIA, II

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The following list of algae continues the report on marine algae that have not previously been reported in Washington and southern British Columbia (Norris and West, 1966). Our records supplement the lists of Scagel (1957) and Dawson (1961). All specimens are in the herbarium of the University of Washington and are from the State of Washington unless otherwise indicated.

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Cyanophyta

Aphanocapsa litoralis Hansging was collected on the piles of the new wharf at the Friday Harbor Laboratories, San Juan I., July 27, 1965 *(Norris 5307)*. This alga was growing in large gelatinous masses on posts that contained large amounts of creosote. The algae showed no deleterious affects from the creosote. This species has not been previously reported from the Pacific Coast of North America. It was originally described from the Adriatic Sea. (See Geitler, 1930–1932).

Chlorogloea conferta (Kützing) Setchell and Gardner was collected on filaments of *Rhodochorton purpureum* growing on rocks in a shaded area of the upper littoral region at Mt. Dallas Beach, San Juan I., July 2, 1965 (*West 312*). This species has not been recorded north of San Mateo Co., California on the Pacific Coast of North America (Setchell and Gardner, 1919).

Dermocarpa hemisphaerica Setchell and Gardner was found growing with *Chlorogloea conferta* on *Rhodochorton purpureum* Mt. Dallas Beach, San Juan Island, July 2, 1965 (*West 336*). The previous known range for this species was the coast of central California (Setchell and Gardner, 1919). *D. hemisphaerica* is not clearly distinct from *D. suffulta* which also often grows on *Rhodochorton purpureum.*

Pleurocapsa entophysaloides Setchell and Gardner was collected growing on a boulder cliff at the high littoral level just south of Deadman Bay, San Juan I., June 11, 1964 (*Norris 4986*). Previous records of this species do not list it north of central California (Setchell and Gardner, 1919).

Phaeophyta

Myrionema phyllophilum Setchell and Gardner was found at Mt. Dallas Beach, San Juan I., June 26, 1965, (*Norris 5186*). This species, which grows on leaves of *Phyllospadix,* has previously been known only from Sitka, Alaska (Setchell and Gardner, 1925).

RHODOPHYTA

Goniotrichopsis sublittoralis G. M. Smith is very similar to *Goniotrichum elegans* in its morphology, but it has numerous small irregularly discoidal chromatophores instead of a single stellate chromatophore with a prominent pyrenoid as in *Goniotrichum*. Previously found only on the Monterey Peninsula, California this species was dredged as an epiphyte on various larger algae at Hein Bank, south of San Juan I., July 13, 1965. Field collected plants were quite scarce in the collection, but it was isolated into unialgal culture and herbarium specimens (*West 397*) have been prepared from the cultured material. Smith (1943) did not observe reproductive structures on his specimens but we have found the species readily reproducing by monospores in our cultures. Monospores appear to be transformed vegetative cells produced in both uniseriate and multiseriate regions of the thalli. When mature, the spores are extruded through the thick sheath.

Erythrotrichia carnea (Dillwyn) J. Agardh was collected as an epiphyte on *Ceramium gardneri* from concrete floats at Shilshole Bay Marina, Seattle on October 27, 1964. The species was isolated into unialgal culture and herbarium specimens have been prepared from these cultures (*West 398*). Relatively common as an epiphyte in larger benthic algae in the inland waters of Washington, it is surprising that this species has not been recorded here before this time. Field collected plants and the specimens in culture are morphologically the same as the specimens described from other regions. *Erythrotrichia kylinii,* described by Gardner (1927) as having band-shaped plastids, may be conspecific with *E. carnea* because Kylin (1941) described the plastids in former species as stellate, like those of *E. carnea*. If this characteristic is the same in both species, there appears to be no reason to separate them except for a slight difference in diameter of the filaments. Herbarium specimens of *E. kylinii,* unfortunatey, do not seem to be abailable for comparison with our specimens.

Acrochaetium densum (Drew) Papenfuss was originally described by Drew (1928) as an epiphyte on *Spongomorpha mertensii* from San Francisco. Since that time it has not been observed on the Pacific coast of North America, although Nakamura (1944) discovered it as an epiphyte on *Polysiphonia* in Japan. In our collection it is epiphytic on *Polysiphonia brodiaei* (*West 245, 345*) from Lloyd's Boat House, Duwamish Head, Seattle, January 11, 1965 and March 15, 1966. This species with its host may have been transported by marine shipping from Cailfornia since both are known only from the one location in Washington.

Kylinia arcuata (Drew) Kylin was previously reported from Duxbury Reef, Moss Beach (Drew, 1928) and Bodega Bay (Johansen, 1966) in California and only once from Washington (Cape Flattery; Drew, 1928). We have observed *K. arcuata* as an epiphyte on *Polysiphonia brodiaei* from Lloyd's Boat House, Duwamish Head, Seattle, March 15,

1966 (*West 347*). *Acrochaetium densum* and *Kylinia arcuata* grow on the same host and have certain morphological features in common. Both species were isolated into unialgal culture and monosporangia of both are similar in position and in general morphology. The two species usually can be distinguished by differences in their basal systems, however. *K. arcuata* has a single basal cell whereas *Acrochaetium densum* ordinarily has a system of prostrate filaments arising from two hemispherical cells derived from the original monospore. Occasionally, however, in culture the spores of *A. densum* do not divide to form two hemispherical cells but instead produce erect filaments directly. In these cases the plants are indistinguishable from *Kylinia arcuata*. The basal system of *K. arcuata* shows no modifications, remaining unicellular in all culture conditions tested.

The variation exhibited by *Acrochaetium densum* indicates that use of the basal system morphology may not be entirely reliable as a major taxonomic criterion. Further culture work with other species will disclose more information on this problem.

Audouinella pectinata (Kylin) Papenfuss was previously known only from Denmark (Rosenvinge, 1909) and Sweden (Kylin, 1944). Our Identificaiton was based on specimens from culture. One clone now in unialgal culture was obtained from a mixed species culture of plants dredged from Hein Bank, south of San Juan I., Washington, June 10, 1964 (*West 399*). A second clone was obtained from a specimen of *Ptilota hypnoides* (*West 293*) collected in the intertidal zone at Glacier Point, Vancouver I., British Columbia, Canada, June 30, 1965. The tetrasporophytes of the clones in culture produce monosporangia and tetrasporangia. Monospores produce new tetrasporophytes. The dioecious gametophytes which develop from the tetraspores have a unicellular base in contrast to the multicellular base of the tetrasporophyte. The gametophytes form monosporangia and sexual structures.

Rhodophysema georgii Batters. Uncertainty was expressed in our previous report on this species in our region (Norris and West, 1966) because it often is especially difficult to distinguish *R. georgii* from basal cushions of *Smithora naiadum*. Both species grow on the margins of *Zostera* and *Phyllospadix* leaves, but with close examination one can see a distinct difference between the two species. *Smithora* cushions are large, thick and purplish-black, whereas the thalli of *Rhodophysema georgii* are smaller, thinner and are a more distinct purplish-red color. The most reliable method for distinguishing between these two species is by examination of the chromatophores in the cells. *Smithora* cells contain a single chromatophore that is stellate and may be axial or peripheral in position. *Rhodophysema* chromatophores, on the other hand, are numerous in each cell, peripheral in position and disc-shaped.

Iridea lineare (Setchell and Gardner) Kylin has been reported as far north as Cape Mears, Oregon (Doty, 1947). In our collection it was found growing in the intertidal region at the site of the Minnesota Sea-

side Station near Port Renfrew, Vancouver I., British Columbia, July 29, 1964 (*Norris 5239*). This species is perhaps the most distinctive in the genus as it occurs on the Pacific coast of North America in that several very narrowly cuneate thalli grow from a common holdfast. Most of the other species have a much broader basal part of the blade.

Antithamnion pygmaeum Gardner, a species closely allied to *Antithamnion defectum* and occupying a similar habitat, previously had a known range extending from Pacific Baja California (Dawson, 1962) to Cape Arago, Oregon (Doty, 1947). We now record *A. pygmaeum* for two locations in northern Washington: in the sublittoral zone at Hein Bank, Southwest of San Juan I., June 10, 1964, and in the littoral zone at Larabee State Park, South of Bellingham, October 15, 1965 (collected by Maurice Dube). In both cases the plants were discovered growing upon larger benthic algae collected from these sites and placed in culture. Both clones in culture lack the acutely pointed terminal cells of determinate branches found on plants growing in the field. Because of this the cultured specimens appear very much like *A. defectum* which has blunt branch tips in the field and in culture. Several features indicate that the two species are not identical, however. First, hybridization attempts between *A. pygmaeum* and *A. defectum* in culture have not been successful. Second, gland cells of *A. defectum* regularly contain a distinct crystalline body extending longitudinally but the gland cells of *A. pygmaeum* apparently never include this structure. Finally the basal cell of each determinate branch in *A. pygmaeum* has the potential to form an indeterminate branch and often does so. *A. defectum* does not exhibit this tendency in either field collected or laboratory cultured material.

In general the dimensions for vegetative and reproductive structures are smaller in the cultured clones than other authors' data indicate for field collected specimens. Herbarium specimens of male, female and tetrasporic material have been prepared from cultured plants. The Hein Bank clone was assigned the number *West 406* and the Larabee State Park clone the number *West 407*.

Ceramium gardneri Kylin is isolated and growing in culture from two collections at Shilshole Bay Marina, Seattle, October 27, 1964 (*West 215*), and September 8, 1965 (*West 334*). Previously this species was not known north of Coos Bay, Oregon (Doty, 1947).

Hymenena kylinii Gardner was found growing as one of the dominant intertidal species on the reef at the site of the Minnesota Seaside Station near Port Renfrew, Vancouver I., July 29, 1965 (*Norris 5254*). Previously this species was collected no farther north than Cape Blanco, Oregon (Doty, 1947). This species seems to be closely allied with *Hymenena flabelligera* and may be only a variant of that species caused by different environmental conditions.

Cryptopleura corallinara (Nott) Gardner was known only from Mexico and southern California until 1965 when Dawson reported it in his collections in northern California (Dawson, 1965). In our region

fruiting specimens were found in several localities: dredged at 5–7 fathoms, Partridge Bank, west of Whidbey I., July 6, 1965 *(Norris 5196)*; intertidal at American Camp Beach, San Juan I., July 2, 1965 *(Norris 5217)*; intertidal on the reef at the side of the Minnesota Seaside Station, near Port Renfrew, Vancouver I., British Columbia, July 29, 1965 *(Norris 5256)*.

Chlorophyta

Pseudodictyon geniculatum Gardner. Blades of *Cymathere triplicata* collected in the drift at Cattle Point, San Juan I., June 15, 1965 *(Norris 5181)* have extensive infections of a partially endophytic green alga that seems to be *Pseudodictyon* because of the tendency of the branches to unite to form a net. Unlike the plants described by Gardner, the endophyte in our collection forms a pseudoparenchymatous tissue mostly on the surface of the host. Sporangia may be formed in the pseudoparenchyma as well as by the endophytic filaments. Sporangia in our specimens are from 2 to 4 times larger than the vegetative cells. Biflagellate zoospores were released from the sporangia two days after the collection was made. The zoospores are approximately 10 μ by 5 μ, ovoid, with an acute flagellar end, with a single band-shaped chloroplast onto which a conspicuous stigma is attached. The flagella are approximately 1½ times the cell length. The chloroplasts of most of the vegetative cells contain more than one pyrenoid. Gardner (1909) described a single pyrenoid in his specimens of *P. geniculatum* and it may be that our specimens represent a new species in producing pseudodoparenchyma. Previously *P. geniculatum* has been collected no farther north than Trinidad Bay, California (Dawson, 1965), although Doty (1947) records a doubtful collection by Gardner at Sunset Bay, Oregon.

Pseudulvella consociata Setchell and Gardner was found on shells of *Calliostoma* sp. dredged at Mosquito Pass, Northwest of San Juan I., October 29, 1966 *(Norris 5308)*. The filaments of this alga form a solid encrusting layer on the shells, and the basal system does not penetrate the host shells. One or two pyrenoids may be present in the chloroplasts of apical cells of erect filaments, although most chloroplasts have one. This species has not been previously recorded north of central Oregon (Doty 1947).

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